

BARTENEV, G. M.

Bartenev, G. M. Investigation of the plastic flow of polybutadiene. Page 1210.

The M. V. Lomomosov
Inst. of Precise Chem.
Technology Chair of Chemistry and
Physics of Rubber - Moscow
February 28, 1950.

SO: Journal of Physical Chemistry, Vol. 74, No. 10. October 1950.

BARTENEV, G. M.

USSR/Engineering - Glass

May 51

"Problem of Brittleness of Silicate Glass,"
G. Bartenev

"Zhur Tekh Fiz" Vol XXI, No.5, pp 579-588

Examd brittleness of samples by plotting breaking point in relation to time under const or variable load. Shows that for long time intervals this relation coincides with empiric formula by Holland and Turner (cf. "J. Soc Glass Tech" 24, 46, 1940). Submitted 10 Feb 50.

LC

182T68

BARTENEV, G.M.
S.A.

sect. A

Drawing Strength

539.412 : 539.213

1948. On the strength of threads of amorphous material. G. Bartenev. *Zh. Tekh. Fiz.*, 21, 589-92 (No. 5, 1951) *In Russian*.

In her study [*Zh. Tekh. Fiz.*, 15, 436 (1945)] of the tensile strength of threads produced from an amorphous substance by drawing, T. A. Kontorova did not take into account the fact that surface cracks have a greater effect than internal cracks. The author's derivation leads to the formula for the strength of thread, $P = \text{const.} / R \sqrt{L} = \text{const.} / \sqrt{L} = \sqrt{(v/v_0)}$, where R is the final radius and L the length of the thread, v_0 is the rate of flow of, e.g., molten glass, and v is the linear velocity of winding the thread on the drum. A. GELSTICH

CA

19

Calculations of the strength of tempered glass. O. M. Bartenev and V. I. Rozanova. *Steklo i Keram.* 8, No. 7, 10-14 (1951).—Resistance P (in kg./sq. cm.) of tempered sheet against bending and stretch is expressed by $P = P_0 - (x/B \times 10^9) \Delta$, where P_0 is resistance of untempered glass in kg./sq. cm., Δ is extent of tempering in $^{\circ}\text{C}/\text{cm.}$, B is optical stress const. in sq. cm./kg., and x is a dimensionless coeff. This equation is also applicable to rods, cylinders, etc., the only difference being that x has different values. Values of x are given for a glass sheet. This equation is valid if the shape is tempered, with ends being insulated. If the ends of the shape are open, the equation becomes $P = K(P_0 - (x/B \times 10^9) \Delta)$, where K is a correction coeff. Both equations are applicable for up to 5 N/cm. of tempering, where $N = 540$ ma. B. Z. Kamich

1952

CA

2

The role of the energy term in the equation of state of rubber. G. M. Bartenev. *Kolloid. Zhur.* 13, 233-41 (1951); *cf. C.A.* 44, 11181f; 45, 1846c. — The general belief that the term $\partial U/\partial \lambda$ in the equation $V_0 f = (\partial U/\partial \lambda) - T(\partial S/\partial \lambda) + p(\partial V/\partial \lambda)$ is negligible had no satisfactory expl. proof. This proof is now given. V_0 is the original, and V the variable vol. of the rubber sample; λ is the variable length of the sample divided by the original length; p is the external pressure, T abs. temp., U internal energy, and S is entropy. The derivations are taken at const. p and T . As $p(\partial V/\partial \lambda)$ is very small, $(\partial U/\partial \lambda)_{p,T} = V_0 f / (1 - 3\beta T - T(\partial \ln f / \partial T)_{p,\lambda})$; β is the coeff. of linear expansion. The energy U consists of an elastic and a high-elastic term; for rubber, the elastic part of $\partial U/\partial \lambda$ is about 0.001 $V_0 f$ and can be neglected; it comes from deformation of valence angles and from increase in the distance between particles along the stress direction. The product $V_0 f$ at const. λ was a linear function of temp., for 2 vulcanized rubbers contg. 2 and 6, resp., parts of S for 100 parts smoked sheet, above the cryst. temp. (25° for softer and 10° for harder rubber). β was 2.1×10^{-4} /degree. The high-elasticity modulus was 17 for harder, and 9.5 kg. wt./sq. cm. for softer, rubber at 25°. The derivative $\partial U/\partial \lambda = 0$ between 25 and 80° except for soft rubber at high λ (e.g., above $\lambda = 4.5$ at 60°), when $\partial U/\partial \lambda$ became neg. These neg. values show that the re-orientation of particles caused by extension is, at great λ , accompanied by a change in the distance between particles in the direction normal to elongation. The V changed reproducibly when λ increased and decreased. The lattice structure was not altered by temp. changes, since these did not cause stress relaxation.

J. J. Bikerman

Moscow Inst. Fine Chem Technol.

CA

30

Theory of superelastic deformation of rubber. G. M. Bartenev, *Doklady Akad. Nauk S.S.S.R.* 76, 189-192 (1981); cf. *C.A.* 44, 11131f. — Stress-strain data at 80° for vulcanized natural rubber gum stock contg. 2% S are in better agreement with the theory previously derived by B. (Zhur, *Tek. Fiz.* 20, 481(1950)) than with any of the theories proposed by others. H. K. Livingston

2

A

Variation of the vitrification temperature of silicate glasses - with the velocity of cooling or heating. O. M. Hartenev. *Doklady Akad. Nauk S.S.S.R.* 76, 227-30 (1961). The vitrification temp. T_v is defined as the temp. at which the curve of a given phys. property as a function of the temp. T has an inflection, i.e. as the temp. of fastest change of that property. If the cooling or heating is done at the const. rate $\Delta T/\Delta t$, i.e. if the glass is allowed to remain in a temp. range ΔT in the neighborhood of T_v for a length of time Δt , that Δt should be proportional to the relaxation time τ , i.e. $(\Delta T/\Delta t)\tau = \text{const.}$, and, at the limit of ΔT shrinking to T_v , one has for the rate $w = |dT/dt|$ of heating or cooling, $w\tau = \text{const.}$ From $\tau = \tau_0 \exp U/RT$, where U = activation energy, $1/T_v = C_1 - C_2 \log w$, where C_1 and C_2 are const., $C_2 = 2.3 R/U$. This relation between T_v and w is analogous to that between T_g and the frequency of deformation of polymers (C.A. 44, 3534a). The formula was tested, on a glass of the compn. SiO_2 70.9, Na_2O 16.1, K_2O 0.6, CaO 8.1, MgO 2.9, Al_2O_3 0.8, SO_3 0.6, Fe_2O_3 0.1%, on heating by the curves of thermal expansion, and on cooling by the quenching curves; in the latter case, the rate of cooling was detd. by $w = 2\lambda(T_v - T)/\rho c d$, where λ = heat cond., c = heat capacity, ρ = d., d = thickness of the glass plate, T = temp. of the surrounding medium. Plots of $1/T_v$ as a function of $\log w$ actually give a straight line, common for cooling and for heating, with $C_2 = 1.225 \times 10^{-4} \text{ degree}^{-1}$, $C_1 = 3.55 \times 10^{-2} \text{ degree}^{-1}$, $U = 8.65 \times 10^4$. N. Thon

BARTENEV, G. M.

Journal of Applied Chemistry
Vol. 4 Feb. 1954
Industrial Inorganic Chemistry

Correlation between the degree of hardening and the thickness of flat glass. G. M. Bartenev and V. I. Rozanova (*Shtklo i Keram.*, 1952, 9, 6; Summary, *Glass Ind.*, 1953, 34, 545-546). Sheets 30 x 50 or 85 x 130 mm. and 2-26 mm. thick were cooled in still air or in air blasts of known pressure. The degree of hardening, Δ , was measured in polarised light as the path difference for 1 cm. length. The results confirmed the theoretically derived relationship: $\Delta = BaET_s h d / (1 - \sigma) (6 + hd)$, where B is the optical stress constant, α the thermal expansion, E the modulus of elasticity, T_s the difference between the cooling air and the softening temp., σ Poisson's ratio, h the coeff. of heat loss, and d the thickness of the glass. For the glass SiO_2 70.9, Na_2O 16.1, K_2O 0.6, CaO 8.1, MgO 2.9, Al_2O_3 0.8, SO_3 0.5, and Fe_2O_3 0.1%, B was 2.58×10^{-7} sq. cm. per kg. and $\alpha E / (1 - \sigma)$ was 7.80 kg. per sq. cm. per 1° . The simplified relationship, $\Delta = Scd / (6 + cd)$, where c is an empirical constant related to h , is applicable to ordinary commercial glasses. Values of c are given for air-blast pressures of 0-800 mm. (water-gauge). J. A. SUGDEN.

11-10-57

BARTENEV

✓ Formula for calculating the extent of hardening of flat glass as a function of the thickness. G. M. BARTENEV AND V. I. ROZANOVA. *Steklo i Keram.*, 9 [10] 6-7 (1932).—The extent of hardening, Δ , in a/cm . (a is one-half the glass thickness) can be calculated from the following approximate formula: $\Delta = A \frac{hd}{b + hd}$ where d is thickness of glass (cm.), h is relative coefficient of heat loss during hardening, and $A = \frac{1}{2} B \times 10^3 \frac{\beta E}{1 - \sigma} T_p$, where B is optical constant of stresses (cm.²/kg.), β is coefficient of linear expansion, E is Young's modulus, σ is Poisson's coefficient, and T_p is temperature of vitrification calculated from the temperature of the hardening medium. This formula was checked against experimental data obtained with glass of SiO₂ 70.9, Na₂O 16.1, K₂O 0.6, CaO 8.1, MgO 2.0, Al₂O₃ 0.8, SO₃ 0.5, and Fe₂O₃ 0.1%. Three conditions of cooling were observed: (1) natural convection ($p = 0$), (2) air stream (excess pressures of $p = 50$ mm H₂O and 50 mm Hg), and (3) distance from nozzle to glass, 50 cm. Calculated and experimental results were alike. For most commercial glasses, $A = 5 \times 10^3$ and the above formula becomes $\Delta = 5 \times 10^3 \frac{cd}{b + cd}$, where h is replaced by the empirical constant c having the same dimension, and Δ is given in mp/cm . and d in cm. If Δ is expressed in N/cm , then the formula becomes $\Delta = \frac{9cd}{b + cd}$, where c is a constant in $1/cm$. This formula is recommended in technology and industry. The constant c is calculated from $c = 6\Delta/(9 - \Delta)d$. B. Z. K.

BARTENEY, G. M.

Chemical Abst.

Vol. 48 No. 9

May 10, 1954

General and Physical Chemistry

The thermodynamics of elastic bodies. G. M. Bartenev.
Colloid J. (U.S.S.R.) 14, 253-7 (1952) (Engl. translation);
cf. preceding abstr.—See C.A. 46, 8472b. H. L. H.

Physics

BARTENEV, G. M. and VISHNITSKAYA, L. A.

"Investigating the Highly Elastic and Thermodynamic Properties of Rubber
Crystallizing under Tension," Zhur. tekhn. fiz., 22, No.3, 1952

GARTENEV, G. M.

Rubber abs.
V-31 Nov 1953
Vulcanised
Natural Rubber

✓ 4665. ✓ Theory of deformation of rubber. G. M. GARTENEV. *Zh. tekhn. Fiz.*, 1952, 22, No. 7, 1154-65. *Sci. Abs.*, 1953, 56A, abs. 0201. Cf. this journal, 1951, 29, 399. The two components of rubber deformation, namely, the Hooke's component, which in the normal state forms about 0.05% of the total deformation, but has to be taken into account at low temperatures and large deformations, and the highly elastic component, previously incorrectly computed by the author, are derived theoretically and determined experimentally. From the comparison of data, conclusions are drawn concerning the structure of rubber and the assumptions and results of previous investigators. 63424

Plates, Disks, Shells, Membranes Aug 52

2631. Baitenov, G. M., On certain rules of fracture strength of rubber (in Russian), *Doklady Akad. Nauk SSSR (N.S.)* 82, 1, 40-52, Jan. 1952.

Tensile strength of vulcanized Buna S rubber, without carbon black, was measured on 100 or more specimens for each of three thicknesses. Mean strength increases from 21 to 38 kg/cm² with decrease of thickness from 2.2 to 0.4 mm; coefficient of variation increases from 0.13 to 0.19; distribution is approximately normal. Addition of carbon black produces a skew distribution, with mode at 125 kg/cm² and tail at low strengths. As rate of stretching increases from 10⁻³ to 1 sec⁻¹, strength more than doubles; log-log plot is linear. Author stresses limitations of standard tests as index of practical performance.

William Fuller Brown, Jr., USA

USSR/Engineering - Rubber Materials, 21 May 52
Testing

"On the Mechanism of Rubber Failure in Tension,"
G. M. Bartenev, Sci Res Inst of Rubber Ind

"Dok Ak Nauk SSSR" Vol LXXXIV, No 3, pp 487-490

Discusses 2 stages of high-elastic rupture; 1st stage begins with formation of rupture center which develops into zone of slow stage of rupture with rough surface. On reaching crit stress, this zone overgrows into quick rupture zone with mirror-like surface. Slow stage of rupture in rubber is characterized by "fibrous" mechanism peculiar only to

225T33

linear high polymers. Ordinary tensile tests of rubber do not depict real picture of product failure in operation. Submitted by Acad P. A. Rebinder 27 Mar 52.

225T33

BARTENEV, G. M.

BARTENEV, G. M.

232T69

USSR/Engineering - Rubber, Deformation 1 Jun 52

"Laws Governing Homogeneous Compression and Stretching of Rubber," G. M. Bartenev, Res Inst of Rubber Ind

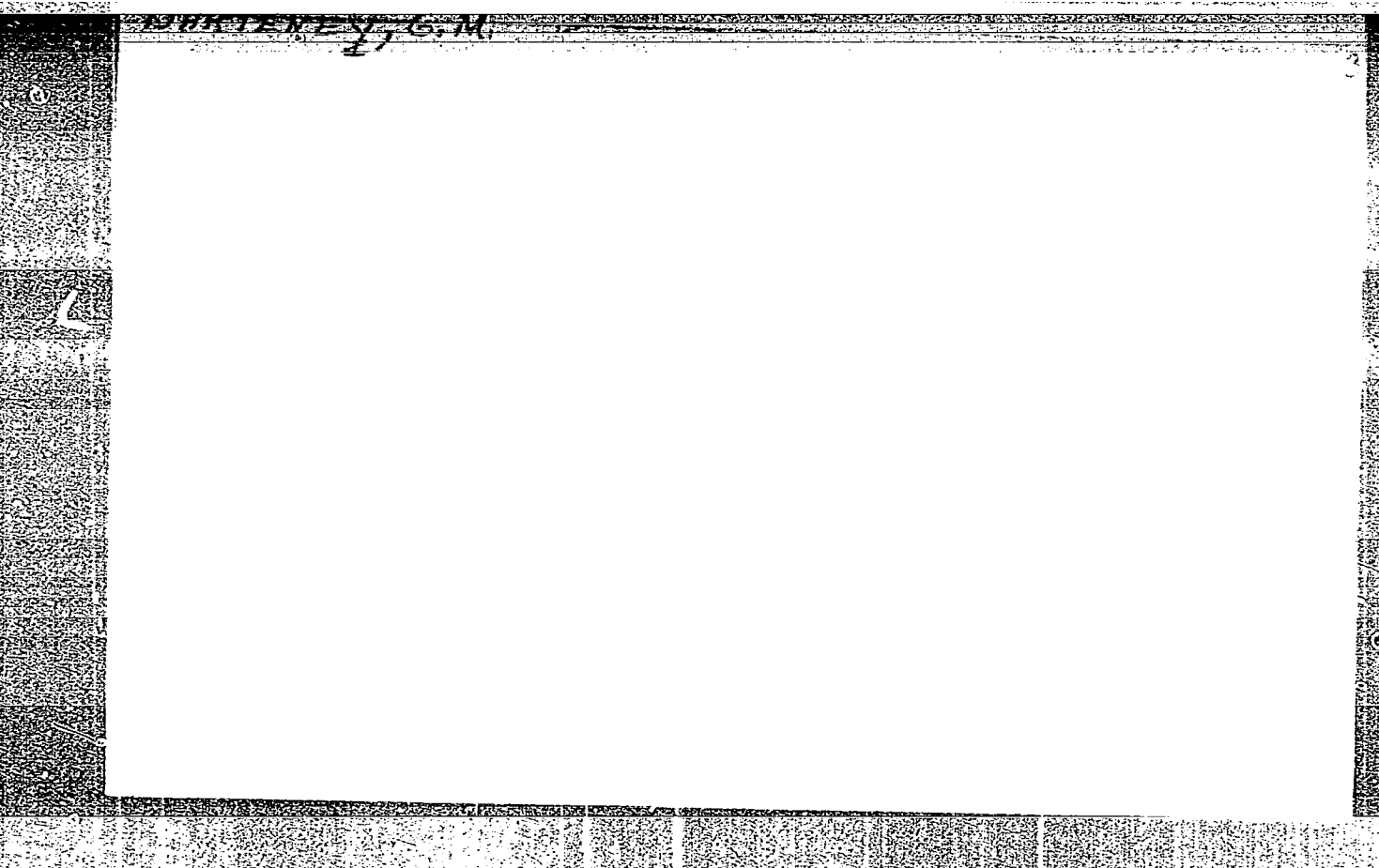
"Dok Ak Nauk SSSR" Vol 84, No 4, pp 689-692

Deformation of rubber was tested and author's formulas, derived in his previous work (cf. "Zhur Tekh Fiz" 20,461, 1950), were applied. It was found that the modulus of elastic deformation rises with increasing filling of rubber, with increasing speed of deformation, and with decreasing time of load. Received 20 Mar 52.

232T69

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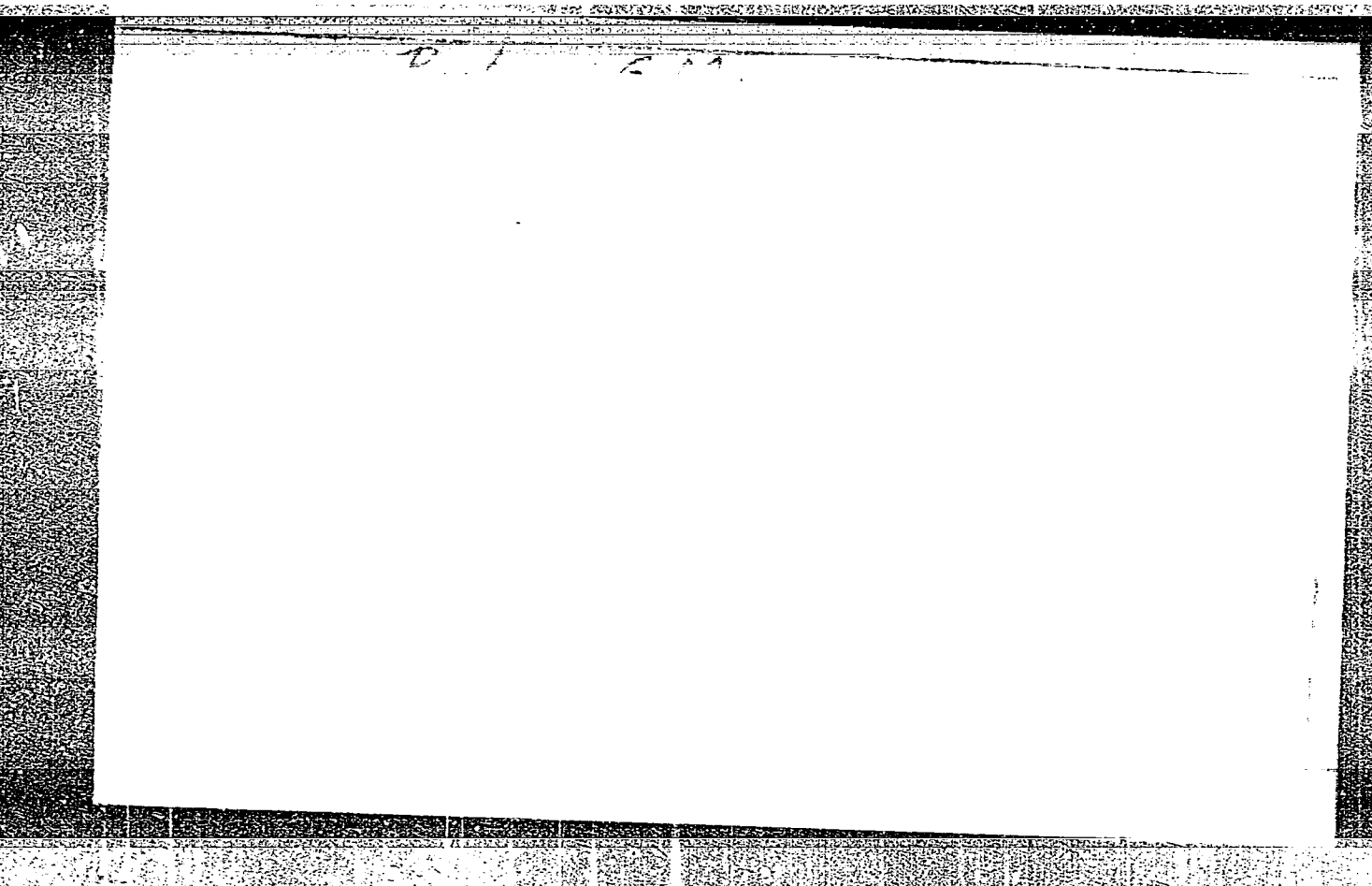


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APPROVED FOR RELEASE: 06/06/2000

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BRITISH, C. I.

Journal of Applied Chemistry
June 1954
Industrial Inorganic Chemistry

Simple optical methods of measuring the elasticity constant of glass. G. M. Battenby and V. I. Rozanova (*Glass & Ceramics*, Moscow, 1953, 10, No. 6, 13).—The optical constant was measured by a simple method of bending the glass specimen. Concentration of stresses around the point of pressure, where the load rests, does not give a true picture of the main load distribution. Consequently tensile stresses on the opposite surface (against the point of load) are calculated. The optical constant depends neither on the stress value nor on whether the stress is positive or negative. It is concluded that the optical constant can be determined on non-notched specimens under a convenient stress and that data obtained for low stresses can be used for calculating the strength of tempered glasses.
BRIT. CERAM. ABSTR. (R.B.C.)

MF
1-10-54

BARTENEV, G.M.

62 ✓ Thermodynamic theory of deformation of highly elastic materials. G. M. Bartenev. *Zhur. Ekspil. i Teor. Fiz.* 25, 225-34(1953); *cf. C.A.* 48, 4933c, 13264c.—A thermodynamic analysis of the high-elastic deformation is undertaken, and an equation is obtained that permits, on the basis of the exptl. data, calcul. of the entropy and energy components of the elastic forces of various highly elastic materials like natural rubber and butadiene polymer. W. J.

1952-27, 211.

Optical constant of elasticity of glass under high loads. G. M.

BARTENEV, Doklady Akad. Nauk SSSR, 91 (3) 1952, 211.

~~1952~~ Optical constant was determined by bending 4.5 ± 1.0 cm glass specimens under two equal and symmetrically positioned concentrated loads (up to 2500 kg/cm^2) and recording with a polarimeter the difference in degree of curvature between the upper and lower surfaces of the specimens. Strength of the specimens was increased by etching to a depth of 0.1 mm with 35% HF. The optical constant did not depend on the size of load and had the same value for compression and extension. The validity of Hooke's law was established for loads up to 2500 kg/cm^2 .

B / K

BARTENEV, G. M.

2877. Bartenev, G. M., and Nosikov, V. I., On the modulus of rubber under static compression (in Russian). *Doklady Akad. Nauk SSSR* (A.S.U.S.), 1957, 1033, Aug. 1957.

Authors extend previous concepts [AMR 6, Rev. 1917] to specimens under purely hydrostatic, isothermal compression. They define a "static" modulus E' the ratio of mean stress to mean strain. E' is characteristic of the specimen, which is the E previously defined is characteristic of the material. They established an empirical relation $E' = E(1 + \nu \epsilon)$, where ν is the ratio of cross-sectional area to area of lateral surface of the specimen in contact with the rigid compressing surface, and ϵ is the strain. They are lubricated. Author's transl. from *Dokl. Akad. Nauk SSSR*, 1957, 1033, Aug. 1957.

BARTENEV, G. I.

USSR/Physics - Compression

1 Nov 53

"Static Compression of Ring-Shaped Flat Rubber Washers," G. M. Bartenev, V. A. Lepetov and V. I. Novikov

DAN SSSR, Vol 93, No 1, pp 15-18

Discuss relaxation curves (kg/cm^2 vs hours) of washers made of 3 types of SKS-30 rubber. Refer to the related work of V. A. Lepetov, Trudy MITKhT im Lomonosova (Works of the Moscow Inst of Fine Chemical Technology im Lomonosov), Vol 4 (1953). Presented by Acad P. A. Rebinder 4 Sep 53.

279T87

BARTENEV, G. M.

FD 195

USSR/Chemistry - Rubber and Elastomers

Card 1/1

Authors : Bartenev, G. M., Ratner, S. B., Novikova, N. M., Konenkov, K. S.

Title : Testing of rubber in regard to its resistance to low temperatures by measuring the loss of elasticity

Periodical : Khim. prom. 4, 32-34 (224-226), June 1954

Abstract : Authors regard as unsatisfactory the standard procedure GOST 408-53 in which the resistance of rubber to low temperatures is determined by measuring the increase in rigidity on the basis of the ratio of deformation at t° to deformation at 20° . Describe in detail a procedure developed by them in which the temperature T is determined at which the rigidity of the rubber increases by the factor $1/K$. As distinguished from the GOST procedure, determination of K (coefficient of resistance to low temperatures) by the new method does not depend on the time during which the deforming force is applied. Four USSR references, one since 1940; two foreign references. Three graphs, two figures.

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 9, p 174 (USSR) SOV/124-57-9-11145

AUTHOR: Bartenev, G. M., Bovkunenko, A. N.

TITLE: The Strength of Thin Filaments and the Structure of the Glass (Prochnost' tonkikh nitey i struktura stekla)

PERIODICAL: Nauch.-tekhn. inform. byul. Vses. n.-i. in-ta stekla. 1954, Nr 6, pp 24-33

ABSTRACT: Bibliographic entry

Card 1/1

DATE RECEIVED

100-443887-100

BARTENEV, G. M.

USSR/Physics - Glass heating

FD-583

Card 1/1 Pub. 153-23/28

Author : Indenbom, V. L.

Title : Theory of the heating of glass

Periodical : Zhur. Tekh. fiz. 24, 925-928, May 1954

Abstract : Studies the case of large temperature drops in glass when part is in the plastic state and part in the elastic state, as occurs during the heat treatment of glass. Finds the dependence of residual stress upon rate of cooling at various temperatures. Thanks Prof. G. M. Bartenev. Refer to related works of G. M. Bartenev, in Steklo i Keramika [Glass and Ceramics], and I. I. Kitaygorodskiy's book Steklo i Steklovareniye, 1950, Moscow.

Institution :

Submitted : December 2, 1953

USSR/Physics - High polymers

FD-1068

Card 1/1 Pub. 153 - 4/24

Author : Bartenev, G. M., and Belostotskaya, G. I.

Title : Elastic and plastic fractures in amorphous polymers

Periodical : Zhur. tekhn. fiz., 24, No 10, 1773-1785, Oct 1954

Abstract : The authors describe the results of investigations of the fractures of high polymers in a highly elastic state. Tests were carried out on specimens of vulcanized and plasticized rubber at 20°C; each of the values represent the mean value of 15-20 specimens.

Institution : -

Submitted : July 19, 1953

BARTENEV, G.M.

1977. Effect of molecular weight of polymer on the
kinetics of vulcanization and formation of space
lattice. A. S. NISSEYEV, T. M. KURBANOV, and V.
GALIL-OGLY. *Russ Chem Rev* 46, 21, 225-9
of this journal, 1974, vol. 43, no. 1. An English
translation of this paper is in *Chem Abstr* 69:21-21M123 572

BARTENEV, G.M.

3
 The effect of molecular weight of rubber on the kinetics of vulcanization and formation of space lattice. A. S. Novikov, G. M. Bartenev, and P. A. Galil-Ogly. *Doklady Akad. Nauk S.S.S.R.* 94, 253-8 (1954).—Expts. show that the rate of vulcanization at the various stages of the process is not affected by the mol. wt. of the starting material (styrene-butadiene rubber fractions with av. mol. wt. from 100,000 to 1,170,000) as shown by bound S detd. periodically during vulcanization. The dependence between the amt. of reacted S necessary for the initial formation of a 3-dimensional space lattice and the reciprocal of mol. wt. is linear. In vulcanization of rubber with mol. wt. under 1,000,000, there is an initial cross-linking of chains into larger aggregates, and only after achievement of this "crit." mol. wt. does the process lead to a continuous space lattice of the vulcanizate, so that the S utilized in the "growing" process is not utilized for vulcanization cross-linking. The rate of lattice formation, after the addn. of an amt. of S which is detd. by the original mol. wt., does not depend on the magnitude of the original mol. wt. The results are shown graphically. The following amts. of S (in %) are necessary for the initial formation of the space lattice for various mol. wt. fractions: 0.18 for 700,000; 0.31 for 500,000; 1.2 for 140,000; and 1.8 for 100,000. In early stages of vulcanization the ratio of the no. of unions among the chains to the amt. of bound S is const., regardless of mol. wt.
 G. M. Kosolapoff

BARTENEV, G. M.

USSR/Technical Physics

Card 1/1

Authors : Bartenev, G. M., and Peregudova, L. E.

Title : Rate of sliding and its effect on the friction of rubber with and without lubrication

Periodical : Dokl. AN SSSR, 96, Ed. 2., 277 - 279, May 1954

Abstract : Authors describe the results derived in studying the effect of the rate of sliding on the coefficient of friction of rubber over metals (steel and aluminum) with and without lubrication. The investigated rubber (polybutadiene rubber) had a Shore hardness of about 90. It is evident from the path of the curves that the friction coefficient of the tested rubber increases with the increase in rate of sliding and that its value depends upon the nature of the solid surface. Eleven references; 5 USSR since 1939. Graphs.

Institution : Scientific-Research Institute of the Rubber Industry

Presented by : Academician P. S. Rebinder, March 25, 1954.

BARTENEV, G. M.

USSR/Physics - Techn. Physics

Card : 1/1

Authors : Bartenev, G. M.

Title : On the theory of dry friction of rubber

Periodical : Dokl. AN SSSR, 96, Ed. 6, 1161 - 1164, June 1954

Abstract : Theory and experiments show that the physical nature and mechanism of dry friction of rubber and solid bodies are principally different. In contrast to solid bodies, rubber is characterized by the absence of static friction (The coefficient and friction force at standstill are zero). The application of static friction laws of solid bodies to the case of rubber friction is void of any physical sense. The developed friction theory could be applied to friction of other high polymeric amorphous materials etc. Five references. Graphs.

Institution : Scientific Research Institute of the Rubber Industry

Presented by : Academician P. A. Rebinder, April 27, 1954

Application of the equilibrium method to the determination
of structural properties of the structure
of the structure

6

4E2L (2)

2 02-1

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 5, p 167 (USSR) SOV/124-57-5-6197

AUTHORS: Bartenev, G. M., Galil-Ogly, F. A.

TITLE: Mechanism and Patterns of the Fatigue Induced in Rubber by Dynamic Loads (Mekhanizm i zakonomernosti dinamicheskoy ustalosti rezin)

PERIODICAL: V sb.: Stareniye i utomleniye kauchukov i rezin i povysheniye ikh stoykosti. Leningrad, Goskhimizdat, 1955, pp 119-129

ABSTRACT: A study was made of fatigue processes induced by dynamic loads in specimens of industrial rubber made from SKS-30 India rubber. The specimens were tested in two ways: 1) some were subjected to loads of known intensity, and 2) others were subjected to loads that stretched them to their respective limits of extensibility. The authors stress the resemblance which they observed between the fatigue processes that resulted and: (a) The fatigue behavior of rubber subjected to long-term static loads, and (b) the fatigue behavior of metals subjected to repeated loadings. They point out that the strength of rubber subjected to repeated loadings is largely dependent on the chemical processes within the rubber which are induced by such loadings and which occur concurrently with them. The nature and course of such

Card 1/2

Mechanism and Patterns of the Fatigue Induced in Rubber by Dynamic Loads
chemical processes, in turn, depend on the prevailing conditions of load application
and on the specific properties of the rubber in question.

SOV/124-57-5-6197

L. A. Vishnitskaya

Card 2/2

BARTENEV, G. M.

USSR/Chemical Technology. Chemical Products and Their Application -- Crude rubber, natural and synthetic. Vulcanized rubber, I-21

Abst Journal: Referat Zhur - Khimiya, No 2, 1957, 6023

Author: Novikov, A. S., Bartenev, G. M., Galil-Ogly, F. A.

Institution: None

Title: Effect of Magnitude of Initial Molecular Weight of Rubber on Mechanical Properties and Dynamic Fatigue of Vulcanizates

Original

Publication: Sb. Stareniye i utomleniye kauchukov i rezin i povysheniye ikh stoykosti. L., Goskhimizdat, 1955, 140-156

Abstract: A study was made of vulcanizates prepared from different fractions of SKS-30A of molecular weight 50,000-1,200,000. Mechanical properties were studied using a dynamometer of the Polanyi type, and the fatigue by means of a special apparatus, at constant amplitude of deformation and also with constant terminal load (selecting the residual deformations). Rate of addition of S to rubber does not depend on its molecular weight, although degree of vulcanization, determined on

Card 1/2

USSR/Chemical Technology. Chemical Products and Their Application -- Crude rubber, natural and synthetic. Vulcanized rubber, I-21

Abst Journal: Referat Zhur - Khimiya, No 2, 1957, 6023

Abstract: the basis of equilibrium modulus, is lower, with all other conditions being equal, in the case of vulcanizates of rubbers of lower molecular weight. This is due to the fact that with low molecular weights the addition of S does not yield immediately a single spatial structure and a portion of the S is added intramolecularly. Stress relaxation in vulcanizates with identical vulcanizing group occurs more rapidly in the case of a rubber of low molecular weight. With an equal concentration of cross linkages the mobility of the chains is reduced in the case of low molecular fractions. Strength, both tensile and of fatigue resistance, increases with molecular weight only as far as about 300,000, remaining practically constant beyond this value. On mixing of high molecular fractions with low molecular there is observed a sharp decrease in strength, even though the average molecular weight value may be sufficiently high under such conditions.

Card 2/2

USSR/Chemical Technology. Chemical Products and Their Application.
Glass. Ceramics. Building Materials.

J-12

Abs Jour: Referat Zh.-Kh., No 8, 1957, 27608

Author : G.M. Bartenev.

Inst :

Title : Liquid and Vitreous States.

Orig Pub: vSb Stroyeniye stekla. M. - L., AN SSSR, 1955, 293-296.

Abstract: According to the author, the theory of disorderly lattice (Sachariassen), as well as the theory of semicrystalline state (Lebedev) are wrong. Available experimental data obtained with various methods permit to surmise that the theory nearest to the actuality is the quasicrystalline theory, i.e. such a theory, which admits that the structure of glass is amorphous with regions of close orders extending over several atomic distances. See RZhKhim., 1957, 1564, 5159.

Card : -1/1

-6-

Bartenev, F. M.

✓ The photograph of rubber gasket used in the No. 7.

BORTENEV, G. M.

485. Mechanism of flattening and estimation of rubber washers in contact with gaseous media

Flattening of the creases as a function of degree of

BART FUSKIN AND PEREC, L. A.

USSR/Chemistry - Elastomers

FD-3004

Card 1/1 Pub. 50 - 5/17

Author : Bartenev, G. M., Dr Chem Sci

Title : Resistance to cold and gas permeability of rubbers

Periodical : Khim. prom. No 6, 344-345, Sep 1955

Abstract : On the basis of experimental data and theoretical considerations, brings out that there is a direct relationship between the gas permeability of synthetic rubbers and their resistance to cold, because both properties depend on the mobility of the rubber molecules. Rubbers containing polar groups exhibit strong intramolecular forces: both their gas permeability and cold resistance are low. Polar rubbers, which have more flexible molecules, exhibit a high gas permeability, but are more resistant to cold. Low gas permeability and high cold resistance in a pure synthetic polymer are incompatible, but the presence of appropriate additives may modify this relationship. Two graphs, one table. Eleven references; 3 USSR, all since 1940.

Institution : Scientific Research Institute of the Rubber Industry

USSR/Physics - Rheology

FD-3021

Card 1/1 Pub. 41 - 5/15

Author : Bartenev, G. M., Moscow

Title : The relationship of time and temperature to the strength of solid bodies

Periodical : Izv. AN SSSR, Otd, Tekh. Nauk 9, 53-64, Sep 55

Abstract : Theorizes that crack growth and, consequently, fracture under less than critical loads may not occur without the thermal motion of atoms and molecules. Presents experimental data and empirical formulae on the effect of time and temperature upon strength. Discusses the molecular theory of temperature-time effect upon strength. Relates fracture time to load and temperature. Discusses application of formulae to silicate and polymer glasses. Formulae, graphs. Forty references, 18 USSR.

Institution: Scientific-Research Institute of the Rubber Industry

Submitted : June 8, 1955

"APPROVED FOR RELEASE: 06/06/2000

CIA-RDP86-00513R000203720017-9

~~GA~~ RICHENEY C.

APPROVED FOR RELEASE: 06/06/2000

CIA-RDP86-00513R000203720017-9"

PYATKIN, S.F., kandidat tekhnicheskikh nauk; **BARTENEV, G.M.**, doktor khimicheskikh nauk

Tension measurement in shaping glass fibers by the method of
continuous drawing. Leg.prom.15 no.7:21-23 J1'55.
(Glass fibers) (MIRA 8:10)

BARTENEV, G. M.

U S S R .

3258. Theory of two-dimensional extension of rubber. G. M. BARTENEV. *Kolloid Zhur.*, 1955, 17,

18-23; *Chem. Abs.*, 1955, 49, 7887. For small two-dimensional extensions (less than 10%) the usual equations of the theory of elasticity hold. For extensions between 10% and 100%, $\sigma = (\pi/2)E\epsilon$; σ is true stress, ϵ deformation, and E modulus of unidimensional extension. For large extensions, $\sigma = (kT/p) - \{L_1(N/\lambda_\infty) - L_1(1/\lambda_\infty)\}$, p is a material constant, $\lambda = 1 + \epsilon$, λ_∞ is λ extrapolated to infinite σ , L is Langevin function, and L_1 is the inverse of Langevin function. This equation was derived from considering the orientation of chains in a stretched membrane and was confirmed by experiments on vulcanised butadiene-styrene rubber at 70°. L. R. G. Treloar's equation was not suitable.

852D21MD23.6634241

Sci. Res. Inst. Rubber Industry, Moscow

BARTENEV, G M

32075. This is a review with 24 references. 1954

217

BARTENEV, G. M.

USSR ?

Laws of unidimensional compression and stretching of
rubber G. M. Bartenev (Sci. Research Inst. Rubber Ind.,
Moscow) *Rubber Chem. & Technol.* 28, 19-24 (1955)
See C.A.B. 48, 148C.

C. C. Davis

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BARTENEV, G. M.

USSR .

Structure of glass and strength of glass fibers. G. M. Bartenev and A. N. Bovkunenko (All-Union Sci. Research Inst., Glass, Moscow). *Zhur. Fiz. Khim.* 29, 504-12 (1953). The breaking stress P of alkali-free glass filaments increased with the degree D/d of extension (D orifice diam., d fiber diam.) rapidly at small D/d and linearly at $D/d > 50$. The P of filaments drawn out at 1240° was greater than that of 1180° filaments; e.g., at $d = 20 \mu$ and $D/d = 100$, P was 115 and 103 kg. wt./sq. mm., resp. When the filaments were etched in HF, their P rose but remained const. on further dissoln. of the surface layer in HF; thus, decrease of d by 1 μ and by 20 μ resulted in equal values of P ; these final values were about 60 kg. wt./sq. mm. greater than those before etching. As P was independent of d and depended on D/d only, the higher strength of thinner filaments cannot be due to a lesser probability of flaws in a smaller specimen but is caused by the act of stretching. When stretching is small, flaws are oriented, while large stretching orients chem. bonds. J. J. Bikerman

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"APPROVED FOR RELEASE: 06/06/2000

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APPROVED FOR RELEASE: 06/06/2000

CIA-RDP86-00513R000203720017-9"

USSR/ **BARTENEV G.M.**
Chemistry - Physical chemistry

Card 1/2 Pub. 147 - 8/22

Authors : Bartenev, G. M.

Title : On the theory of viscosity and plasticity of amorphous substances and dispersion systems

Periodical : Zhur. fiz. khim. 29/11, 2007-2017, Nov 1955

Abstract : Flow and viscosity formulas considering the effect of stresses were obtained for steady laminary flows on the basis of molecular-kinetic representations about thermal motions in amorphous bodies and dispersion systems. The law of flow at small tangential stresses transforms into the Newton law and the viscosity formula into the Ya. I. Frenkel formula but with a different numerical value of the pre-exponential multiplier.

Institution : All-Union Scient. Res. Glass Inst. Pedagogical Inst. im. Potemkin

Submitted : January 24, 1955

Card 2/2 Pub. 147 - 8/22

Periodical : Zhur. fiz. khim. 29/11, 2007-2017, Nov 1955

Abstract : The stress interval, where Newtonian steady flow takes place, was found to decrease with a drop in temperature and increase of particle dimension. It is pointed out that the viscous (liquid) and plastic (solid) states of an amorphous substance and dispersion system are only conditional. Fifteen references: 11 USSR, 2 Germ., and 2 USA (1925-1955). Graphs.

BARTENEV, G. M.

USSR/ Chemistry - Rubber fatigue

Card 1/1

Pub. 22-20/54

Authors : Bartenev, G. M., and Galil-Ogly, F. A.

Title : ~~Dynamic fatigue~~ and the mechanism of the destruction of rubber during repeated deformations

Periodical : Dok. AN SSSR, 100/3, 477-480, Jan 21, 1955

Abstract : Experiments showed that dynamic fatigue of rubber results from chemical oxidizing processes and the destruction of rubber during repeated deformations occurs through the breaking away of the rubber chains under the effect of mechanically activated chemical processes. The physical factors affecting the dynamic fatigue of rubber are listed. The relation between the fatigue and strength characteristics of rubber is explained. The basic laws governing the dynamic fatigue of rubber and the mechanism of destruction during repeated elongations are described. Eight references: 6 USSR and 2 English (1936-1953). Graphs, illustrations.

Institution : Scientific Research Institute of Rubber Industry

Presented by : Academician V. A. Kargin, May 22, 1954

BARTENEV, G.M.

The frictional relations between highly elastic materials and hard smooth surfaces. Dokl.AN SSSR 103 no.6:1017-1020 Ag '55.
(MIRA 9:1)

1.Moskovskiy gorodskoy pedagogicheskiy institut imeni V.P.
Potemkina. Predstavleno akademikom P.A.Rebinderom.
(Friction) (Elastomers) (Elasticity)

BARTENEV, G. M

BARTENEV, G. Gold resistance and gas-penetrativeness of rubber. p. 35. Vol. 5,
no. 8, 1956 ELEKTROENERGIJA. Sofia, Bulgaria

SOURCE: East European Accessions List (EEAL) Vol 6, No. 4--April 1957

BARTENEV, G.M., professor, doktor tekhnicheskikh nauk; IVANOVA, A.I.

Methods of testing glass for strength. Stek. i ker. 13 no.7:12-15
Jl '56. (Glass--Testing) (MIRA 9:9)

BARTENEX G.M.

... of the initial molecular weight of

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... with that for fraction F. ...
... forms only if the molecular weight M is greater than
... 100; when the initial M is smaller, sulphur links
... and lattice formation starts when

BARTENBY, G.M., NOVIKOV A.S. ...

(e.g. 50 kg/cm² cm), the time to rupture at constant
extension at a constant maximum deformation
decreased from 1 to 10 and the time to rupture

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V.M.H.
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FRANKEN, G. N. S.

1917. Molecular nature of the friction of rubber.
G. N. FRANKEN, *Ann. Phys.*, 1917, 18, 249-53.
The friction of rubber, against rubber or other solid, is
regarded as a molecular kinetic process caused by
thermal motion of the molecular chains along the
contact surface, in which energy barriers which
depend on the molecular adhesion forces are over-
come. On this basis a theory has been developed
of the friction of rubber of any degree of roughness
against smooth solid surfaces. An opposing view
points out that under external friction rubber
behaves as a solid which provides the basis for the
application of Derjaguin's theory of friction to
rubber.

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BARTENEV, G.M.

Category : USSR/Atomic and Molecular Physics - Physics of high-molecular substance D-9

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1007

Author : Bartenev, G.M., Vishnitskaya, L.A.

Inst : Scientific Research Inst. of the Rubber Industry, Moscow

Title : Effect of Dispersed Fillers on the Relaxation Properties of Rubber.

Orig Pub : Kolloid. zh., 1956, 18, No 2, 135-144

Abstract : The relaxation of stresses in filled rubber consists of three processes: relaxation of the chains, relaxation due to the separation of the rubber chains from the filler particles and to the regrouping of the filler particles (relaxation of filler), and chemical relaxation. A prolonged stress relaxation of rubber made of SKS-30 latex with various amounts of active filler (candel lampblack) and inactive filler (chalk) was investigated at a deformation of 100%. It is shown that the relaxation time of the chains and of the chemical relaxation, making it possible to distinguish between these processes. The usually observed relaxation process in rubber with active filler is caused only by the establishment of equilibrium with respect to the chains.

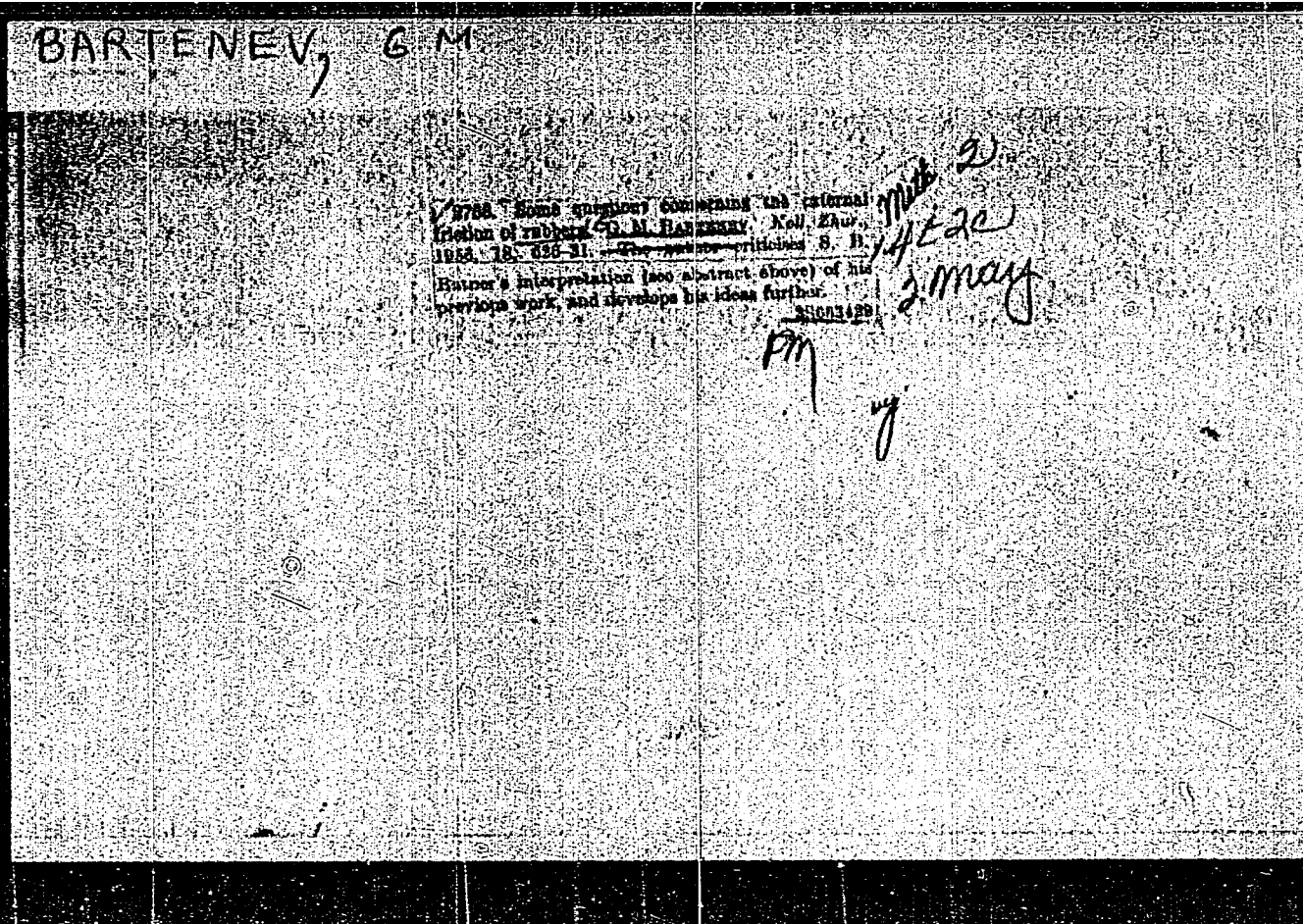
Card : 1/1

BARTENEV, S. M.

Investigation of the dynamic properties of
~~rubbers~~ by the spontaneous contraction
 method. G. M. Bartenev, M. M. Kuznetsov
 and M. K. Kuznetsov, Physica, 1958, 18, 395-403.
 In Russian, with English summary. Experimental
 data have been produced showing that the previously
 developed conceptions may serve for a quantitative
 approximation of the phenomena underlying
 the spontaneous contraction of rubbers without
 fillers and that they cannot sufficiently describe
 the behaviour of rubbers loaded with active fillers.
 A correlation has been established between the
 modulus of internal friction and the vitrification
 temperature of rubbers vulcanizates of natural and
 butadiene (BRIL, BRIL-18, 26, 40) rubbers. It was
 shown that the ratio of the internal friction modulus
 of the rubber to the unvulcanized part of its
 dynamic modulus depends little upon the test
 temperature, the type of polymer, the degree of
 vulcanization, and the filler and also plasticizer
 contents.

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Bartenev, G.M.

USSR / Liquids.

D-8

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9097

Author : Bartenev, G.M., Bovkunenko, A.N.

Title : ~~Strength of Glass Fibers~~ and Its Response to Various Factors

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 11, 2508, 2515

Abstract : Experimental findings are presented to show that the statistical theory of strength cannot explain the strength of glass fibers depends on the method of manufacture, the degree of elongation (the principal factor), the chemical composition of the fibers, the temperature of the glass melts, and the fiber of strength, but is practically independent of the transverse dimensions. The apparent dependence of the strength on the diameter of the glass fiber results from the fact that both quantities depend on the same factor, namely the degree of elongation. Formulas are given for the strength of glass fibers and thick filaments.

Card : 1/1

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1691
AUTHOR BARTENEV, G.M., BUROV, S.V.
TITLE The Time Dependence of the Strength of Rubber and the Safety Stress.
PERIODICAL Zhurn.techn.fis, 26, fasc.11, 2558-2562 (1956)
Issued: 12 / 1956

The present work is intended to clarify the following points: 1.) The tensile strength of rubber. 2.) Is there such a thing as a "safety stress" for rubber? (This means a stress below which the material will remain undamaged for an indefinite time (in practice and in principle)). The static fatigue strength of rubber was investigated by tension. The results obtained by tensile tests can be used for the purpose of analyzing the causes of destruction. At first the problem of the time-dependence of strength is discussed on the basis of several works dealing with this problem, which are cited.

Unfilled specimens of SKS - 30-rubber with 0,3 and 3% sulphur and with the equilibrium moduli $E_{\infty} = 2$ and $E_{\infty} = 12$ kg/cm² are investigated, and also filled specimens of rubber containing 50% soot and three weight units of sulphur. These materials were subjected to a tensile test in the case of constant stresses of different intensities at a temperature of 20° C and while no noticeable light-ozone influence was being brought to bear upon the rubber. The duration of tensile stress was determined as the mean value obtained from

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Zurn.techn.fis,26,fasc.11, 2558-2562 (1956) CARD 2 / 2 PA - 1691

20 measurements. The samples were shaped like a double shovel. (Length 25 mm, breadth 7 mm, thickness 1 and 6 mm). After provisional measuring it is possible, at least in the practical sense, to assume the existence of a safety stress. A diagram illustrates the engineer-like determination of this safety stress. Examination in accordance with the usual method by means of a tensile-testing machine furnished the value 22 kg/cm^2 for the safety stress. This "safety stress" depends on the modulus of the rubber; numerical data are attached. Also static fatigue depends on the modulus of the rubber.

Summary: The lower the modulus of the rubber, the more distinctly does the time dependence of strength deviate from the formula by BUSSE-ZURKOV. The time dependence of the strength of rubber is, if the tearing period τ lasts from several seconds to 10^7 sec, practically described by the formula

$\tau = C f^{-k}$ or $\tau = B \sigma^{-\delta}$, where σ and f denote true and dependent tensile stress respectively. On this occasion better results are obtained if moduli are smaller rather than greater. Experimental results make it appear probable that a safety stress exists in the types of rubber investigated, but aging diminishes this safety stress. In the case of rubbers with small moduli a tendency was found to reduce stress and to increase the duration of rupture up to a certain limit, namely the so-called "safety stress". The latter increases with an increasing modulus of the rubber.

INSTITUTION:

BARTENEV, G. M.

Category : USSR/Atomic and Molecular Physics - Physics of high-molecular substance D-9

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 992

Author : Bartenev, G.M., Reytlinger, S.A., Rubinshteyn, B.Ye.,
 Inst : Scientific-Research Institute of the Rubber Industry, Moscow
 Title : Permeation to Gas and Vitrification of Polymers.

Orig Pub : Zh. fiz. khimii, 1956, 30, No 3, 532-536

Abstract : The authors indicate that the permeation to gas of a polymer P and the mobility of its molecular rings are determined uniquely by the diffusion properties. Therefore, the stronger the inter-molecular bonds, the lower P and the higher the vitrification temperature T_v . Starting with an equation for the temperature dependence of the diffusion constant D, and taking into account that the activation energy of the polymer diffusion is greater than T_v and proportional to it, the authors obtained the equation $\log D = A + (BT_v/T)$, where A and B are constants. Assuming $P = D\sigma$, where σ is the solubility of the gas in the polymer, assumed by the authors to be constant for a given gas in all polymers, and making many other assumptions, they obtained $\log P \approx A_1 + (B_1 T_v/T)$. The approximate linear relationships between $\log D$, $\log P$ and T_v actually holds in the region of high-elastic states as shown on the basis of data taken from the literature. Factors that contribute to an increase in T_v simultaneously cause a reduction in P.

Card : 1/1

BARTENOV, G. M.

Handwritten: 1944

V Study of the dynamic properties of random by the method
of time contraction. O. M. Bartenov, M. M. Reznikovskii,
and A. E. Khramov. *Colloid J. (U.S.S.R.)* 43, 389-97
(1981) (English translation).--See O.A. 41, 1:304.
R. M. R.

5441425, 5.11.
USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Author:
Abs-Jour: Bartenev G.M., Luk'yanov I.A.

Inst : Moscow City Pedagogical Institute

Title : Study of Vitrification Temperature of Silicate
and Polymeric Glasses by the Method of Thermal
Expansion

Orig Pub: Uch. zap. Mosk. gor. ped. in-t, 1956, 49, 145-162

Abstract: A study of the dependence of vitrification tem-
perature on conditions of treatment, by the method
of measurement of linear thermal expansion of a
number of vitreous substances of organic and in-
organic origin. Measurements were carried out by
means of a quartz dilatometer of conventional type.

Card 1/6

USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Abs Jour: Referat Zhur - Khimiya, No 9, 1957, 31491

The samples to be measured were subjected to careful annealing, since in hardened samples a relaxation takes place, on approaching the region of anomalous temperatures, which greatly distorts the thermal expansion curve and makes it impossible to determine the vitrification temperature, in as much as structure relaxation becomes superposed over thermal expansion. The annealing temperature was adjusted 10-15° lower than T_g and the samples were held for 5 to 15 hours, after which they were cooled, at a rate of 0.1 degree/minute, for 20-30°, whereupon the rate of cooling was gradually increased to 0.5 degree/minute for 80-100°. Further cooling

Card 2/6

USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Abs Jour: Referat Zhur - Khimiya, No 9, 1957, 31491

was effected with the furnace being turned off. Pressure of the spring against the sample was of 0.07-0.08 kg/cm². Change in pressure up to 2 kg/cm² has a slight effect on results of the determinations. For the study were chosen: rosin, polystyrene, poly-methylmethacrylate, boric anhydride and 5 varieties of silicate glass. The glasses were selected in such a manner as to cover a wide range of temperature of transition from vitreous to viscous-flow state (from 440 to 750°). In studying the temperature of vitrification the rate of heating was varied from 0.2 to 50 degree/minute. Vitrification temperature T_g was determined by the point of intersection of extrapolated

Card 3/6

USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Abs Jour: Referat Zhur - Khimiya, No 9, 1957, 31491

rectilinear portions of the expansion curve. It was found that in most cases, within the investigated range of rate of heating (3 order) - there exists a linear correlation between reciprocal temperature of vitrification and the logarithm of the rate of heating. This correlation is expressed by the formula: $1/T_g = C_1 - C_2 \lg W$, where W is rate of heating, C_1 and C_2 are constants. It was ascertained experimentally that the factors C_1 and C_2 , appearing in this formula, are bound, in the case of various amorphous substances, by the correlation $C_2 \approx 0.031 C_1$. This made it possible to transform the equation into a simpler one: $1/T_g = C_1(1 - 0.031 \lg W)$, which is

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USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Abs Jour: Referat Zhur - Khimiya, No 9, 1957, 31491

of great practical importance, since in order to determine the constant C_1 it is sufficient to know T_g at a standard rate of heating (3 degree/minute). On the basis of experimental data it was ascertained that the energy of activation of a given substance, in the case of almost all of the materials which were investigated, decreases linearly with increase of vitrification temperature, in accordance with the formula: $U = U_0' - aT$. Between zero energy of activation of the investigated substances and their temperatures of vitrification, there holds, on the average, the proportionality: $U_0' = 151 T_g$ calorie/mole. This correlation emphasizes the fact that the temperature

Card 5/6

USSR /Chemical Technology. Chemical Products
and Their Application

I-12

Silicates. Glass. Ceramics. Binders.

Abs Jour: Referat Zhur - Khimiya, No 9, 1957, 31491

of vitrification is determined by forces of inter-
molecular interaction, the magnitude of energy
barriers which must be overcome by the particles
to effect the transition from one position of
equilibrium to another.

Card 6/6

BARTENEV, G. M.

Category: USSR/Chemistry of High-Molecular Substances

F

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 30879

Author : Bartenev G.M.

Inst : Academy of Sciences USSR

Title : Concerning Two Processes of Vitrification

Orig Pub: Dokl. AN SSSR, 1956, 110, No 5, 805-807

Abstract: It is proposed to differentiate processes of mechanical vitrification, determined by frequency or duration of mechanical action, and those of structural vitrification, induced by thermal conditions (rate of cooling). Experiments reveal that either process is independent and that they can be experimentally differentiated; accordingly it is proposed that a differentiation be made between temperature of mechanical T(mech) and of structural T(str) vitrification. Lack of such delineation in the literature is explained by proximity of the two temperatures at ordinary rates of temperature measurements and rates of mechanical action. It is also proposed to differentiate structural state of amorphous matter (liquid and solid state of aggregation) and of mechanical state (viscous flow, highly elastic and resilient state).

Card : 1/1

-3-

BARTENEV, G. M., AND KHASANOVICH, T. N.

"Theory of the Elastic deformation of polymer networks," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan-2 Feb 57, Moscow, Rubber Research Inst. (Potemkin Inst.)

B-3,094,395

BARTENIEV, G. M.

"Second stage crosslinking of polyhydrocarbons," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan-2 Feb 57, Moscow, Rubber Research Inst.

B-3,084,395

BARTENOV, G. M., And BEYULANOVA, L. S.

"Crosslinking of rubbers and its influence on mechanical properties,"
a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers,
26 Jan-2 Feb 57, Moscow, Rubber Research Institute (Etkin Institute)

B-3,004,395

Bartenev, G. M.

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Time dependance of strength of rubber and safe loading.
G. M. Bartenev and S. V. Burkov, *Soviet Phys. Tech. Phys.*
1, 2472-4 (1957), (English translation). — See A. 52, 771c.
H. M. B.

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AUTHORS: Bartenev, G.M. and Rozanova, V.I. (Moscow)

24-5-7/25

TITLE: Heat resistance of glass during cooling.
(Termostoykost' stekla pri okhlazhdenii).

PERIODICAL: "Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk"
(Bulletin of the Ac.Sc., Technical Sciences Section),
1957, No.5, pp.62-69 (U.S.S.R.)

ABSTRACT: The authors investigated the heat resistance of sheet glass which for a certain time was heated at a constant temperature in a furnace and then rapidly cooled in water or by an air jet. The time of movement of the glass from the furnace into the water bath or to the air jet was 1 to 2 sec. The tests consisted of increasing gradually the furnace temperature by steps of 5C and the temperature at which the glass broke up was taken as a measure of the heat resistance. It was found that the glass can withstand higher temperature gradients in the case of unilateral cooling than if cooling is applied from both sides. The test results for water and air for a 6 mm thick glass are given in Fig.1. Fig.2 shows the influence of the heating time on the results for a glass of equal thickness. Figs. 3 and 4 show the pattern of fracture of the investigated glass, the graph, Fig.5, shows the influence of the submersion speed on the heat resistance

Card 1/2

Heat resistance of glass during cooling. (Cont.) 24-5-7/25
in water of a 6 mm and a 2.5 mm thick glass; Fig.6 shows
the influence of the linear dimensions of a 5 mm glass sheet
on its heat resistance in water; Fig.8 shows the dependence
of the heat resistance on the coefficient of linear expansion
according to Schonborn and Douglas. The heat resistance of
glass, i.e. its ability to withstand sudden temperature
differences without fracture, is a more complex characteristic
than its strength since it does not depend only on strength
but also on the cooling intensity, the size factor and a
number of other factors. The influence of various factors
is pointed out. Theoretical conclusions are compared with
experimental results. There are 8 figures, 14 references,
2 of which are Slavic.

Card 2/2

SUBMITTED: September 13, 1956.

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The effect of the chemical composition of glass upon its
hardness. M. I. Burdakov and A. I. Kabanikova.
Dokl. Akad. Nauk SSSR, 1957, No. 3, p. 571 (1957). The chem. compn.
of glass has a definite effect upon its degree of hardening.
Tables, formulas, and charts are given. A. N. Kabanikova

177
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BARTENEV, G. M.

✓ Two stages in the process of network formation in polymers. G. M. Bartenev (Sci. Research Inst. Rubber Ind., Moscow). *Kolloid. Zhur.* 19, 231-7 (1957); cf. *C.A.* 49, 6727a. —Vulcanization proceeds in 2 stages. During the 1st, S is bound, but only branched chains rather than a network form and the equil. modulus E of elasticity remains equal to zero, while during the 2nd stage of network exists and E is proportional to N %, where N is the no. of cross links in the network per cc. At the boundary between the 2 stages, the no. of bound g.-at. of S in 1 g. vulcanizate is R_j/M , where M is mol. wt. before vulcanization, j is the no. of S atoms in a cross link, and β is a coeff. (of the order of 1) depending on the degree of cooling, etc. For a natural rubber and SKB-30A vulcanizates, j was about 7 as if a S₈ mol. opened up. The detn. of the duration of the 1st stage from the behavior of E should be useful in the industry. J. J. Bikerman

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BARTENEV, G.M.

USSR/Atomic and Molecular Physics - Physics of High-Molecular Substances

D-9

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 851

Author : ~~Bartenev, G.M.~~

Inst : -

Title : Concerning the Discussion on the Friction of Rubber.

Orig Pub : Kolloidn. zh., 1957, 19, No 3, 397

Abstract : No abstract.

Card 1/1

BARTENEV, G.M.

57-12-1/19

AUTHORS:

Bartenev, G. M., Lioznyanskaya, S.G.

TITLE:

Strain Relaxation in Quenched Glasses (Relaksatsiya napryazheniy v zakalennykh steklakh).

PERIODICAL:

Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 12, pp. 2738-2743 (USSR)

ABSTRACT:

In this paper, the strain relaxation in quenched glass and its dependence on temperature and the duration of heating was investigated, together with the magnitude of the initial stresses. The experimental data obtained here can be expressed approximately by the following relaxation law:

$$\frac{\sigma}{\sigma_0} = f(t, \sigma_0) = 1 - A \lg t$$

Strain Relaxation in Quenched Glasses.

57-12-7/19

only in the case, where $t \geq 1$ minute, because $G \leq G_0$.

The results of the investigation permit to fix the temperature boundaries of the technical applicability of quenched glass. The formula given above may be employed for the computation of the behaviour of quenched glass at elevated temperatures. There are 5 figures, and 14 references, 3 of which are Slavic.

ASSOCIATION: All Union Scientific Research Institute for Glass, Moscow (Vsesoyuznyy nauchno-issledovatel'skiy institut stekla, Moskva).

SUBMITTED: October 8, 1956.

AVAILABLE: Library of Congress

Card 2/2

BARTENEV, G.M.

BARTENEV, G.M.

Structure and elastic properties of silicate glass. Zhur.fiz.
khim. 31 no.9:1917-1925 S '57. (MIRA 11:1)

1.Moskovskiy pedagogicheskiy institut im. Potemkina; Vsesoyuznyy
institut stekla, Moskva.
(Glass)

Bartenev, G.M.

AUTHORS: Bartenev, G.M., Remizova, A.A.

76-11-24/35

TITLE: Phase Transitions and Their Classification (Fazovyie perekhody i ikh klassifikatsiya)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 11, pp. 2534-2546 (USSR)

ABSTRACT: As a further development of existing conceptions of phases and phase transitions a classification of phase transitions is given here in consideration of the molecular processes of disordering and of the washing-out factors. It is shown that the λ -curves observed in the experiments are characteristic not only of phase transitions of the second type as was hitherto assumed, but also of phase transitions of the first type with disordering processes in the presence of washing-out factors. On the other hand, many phase-transitions are not characterized by λ -curves, which is connected with the influence exercised by the washing-out factors. In many cases the determination of the nature of the transformation and of the appearance of phase transitions only according to the curves of property modifications is difficult. For this purpose the investigation of processes of kinetics and the application of methods for structural investigation

Card 1/2

Phase Transitions and Their Classification

76-11-24/35

is necessary. On the basis of the example of the forming of glass, which is a kinetic and not a thermodynamic process, it is shown that the generally assumed characteristic features of phase transitions of the first and second type (maxima and discontinuities of properties) are insufficient. There are 13 figures and 51 references, 33 of which are Slavic.

ASSOCIATION: Moscow Pedagogical Institute imeni V.P.Potemkin (Moskovskiy pedagogicheskiy institut im. V.P.Potemkina)

SUBMITTED: September 12, 1956

AVAILABLE: Library of Congress

Card 2/2

BARTENEV, G.M.

15(6)
APPROVED: 207/10-59-1-5/57

Author: P. A. Lebedev
New Trends of Colloid Chemistry (Soviet with scientific
colloidal chemistry)

Volume: 1, 1959, No. 1, pp. 44-51 (USSR)

PHYSICAL:

ABSTRACT:

At present, colloid chemistry plays an especially important
part in national economy as it is a physical-chemical science
concerning substances of modern engineering. It is of great
practical importance that at present it is possible to carry
on uninterrupted transitions from lyophobic to lyophilic
systems. Thus, it is possible to obtain technically important
substances with the required structural-chemical properties.
The theory of highly molecular substances and their solutions
has developed into an independent branch of colloid chemistry.
The vitality of modern colloid independent branches of science.
Further, the author describes the course of the 4th All-Union
Symposium of Colloid Chemistry which took place in Tbilisi on
May 11-16, 1958. It was organized by the Odesskye Khimicheskye

U. S. S. R. (USSR) reported on the present state of
research in the field of colloid metals.
A. P. Balaban (Belarus) determined theoretically and
experimentally the regularities of sintering in foams.
M. F. Volkovich with collaborators spoke about the results
of examination of water properties and structure of post by
means of radioactive isotopes.
E. M. Shchegolev considered questions of adsorption and
desorption of electrolytes in colloid dispersion systems.
P. V. Boragin and his collaborators reported on the develop-
ment of the electrostatic stability as well as the theory of
coagulation of dispersions of aerosols.
I. M. Kozlov and A. S. Zubanov reported on the role of the
electrostatic barrier as a factor of practical
significance for a full stabilization of dispersion systems.

Page 3/6

M. V. A. Lebedev showed in his investigations (Ref. 1),
of the protective coverage of the stabilizer is sufficient to
prevent a coagulation of particles.
E. M. Balaban and his pupils dedicated a series of reports to
examining the field of structural characteristics.
A. P. Prudnikov with collaborators examined new appearances of
adsorption in the theory of electrode processes.
E. M. Shchegolev, A. M. Kozlov and A. S. Zubanov reported on
the investigation of the stability of dispersions of adsorp-
tion systems, of their stability with alterations of well
of the chemical modification of the surface of solid partic-
les (see).

To. V. Balaban, P. A. Lebedev and collaborators reported on
the clarification of the process of formation of crystalline
ion structure in the hardening of mineral binding agents.
A. M. Balaban showed that the appearance of high elasticity
is connected with the formation of dispersion structure.
L. S. Piletskiy (Dnepropetrovsk) examined the colloidal state of
aging alloys in thin films and massive samples.

Page 4/6

P. A. Balaban, P. V. Boragin and collaborators reported on
the appearance of dispersion systems.
V. I. Kishinev reported on the appearance of adsorptive
classification of lead and tin at normal temperatures.
A. A. Kozlovskiy and collaborators examined the influence
of rheological properties of printing colors on their
behavior in the printing process.
I. M. Kozlov reported on the regulation of crystallization
and coagulation structures in the production of best table-
better.

BARTENEV, G. M.

BARTENEV, G. M.
Institute of Glass, Moscow

"Scale Effect and Glass Strength."
Paper submitted at
Program of the Conference on the Non-Metallic Solids of Mechanical Properties. Leningrad
May 19 - 26, 1958.

BARTENEV, G. M. (Moscow)

"Rheological Properties and the Structure of Inorganic Glass."

report submitted Third Intl. Congress of Rheology, Bad Oeyngausen, GFR, 23-30 Sep 1958.

BARTENEV, G. M.

AUTHORS: Bartenev, G. M. and Zakharenko, N. V.

138-1-3/16

TITLE: The ^{inter}dependence of the Static Modulus and Hardness of Rubber. (Zavisimost' mezhdu staticheskim modulem i tverdost'yu reziny).

PERIODICAL: Kauchuk i Rezina, 1958, Nr.1. pp. 10 - 12 (USSR)

ABSTRACT: The static modulus of rubber (E) is the coefficient of the ratio between the stress σ and corresponding static deformation of the rubber ϵ at a given temperature and time of observation. It is characteristic for the hardness or stiffness of the rubber. The hardness of a rubber can be accurately and easily determined with an apparatus TM-2 FOCT 263-53. The static modulus for CKC-30, CKH-26, HK, CKH-40 and SKB-30 was investigated; carbon black was used as active filler, and chalk as inactive filler. Altogether 45 mixtures were tested. The static modulus was determined on an apparatus constructed by the Physical Laboratory of the HMIPI. According to a method developed by this laboratory (Ref.4), the hardness was determined on the hardness tester TM-2. It was necessary to make the following investigations: (1) The influence of the thickness of a sample on the degree of hardness. The thickness of the tested samples varied between 1 and 16 mm. It was found that the

Card 1/3

138-1-3/16

Inter
The Dependence of the Static Modulus and Hardness of Rubber.

hardness of a sample becomes constant and does not depend on the thickness of the lamina in 4 mm samples (for hard rubber) and in 6 mm samples (for soft rubber). (2) The minimum number of separate experiments for the determination of the hardness. The hardness number (ГОСТ 263-53) is taken as the average result of 3 measurements. 200 measurements were carried out to determine the hardness for 6 mm thick laminae (for mixtures with and without fillers). The hardness was determined at various points of the lamina at approximately 1 cm distance. The error in the measurements decreased with increasing number of experiments. Distribution curves for rubber based on CKG-30 are given in Fig.2. All values of hardness (Figs. 1, 3, 4 and 5) were taken as an average of five measurements at various points of the lamina. In practice, however, three measurements suffice. (3) The ratio of hardness in relation to the duration of the experiment was determined (Fig.3.). For vulcanised mixtures the optimum duration of the experiments = 10-15 seconds. For mixtures of raw materials it should be not less than 100 seconds. It was concluded that (a) samples of not

Card 2/3

138-1-3/16

The Dependence of the Static Modulus and Hardness of Rubber.

less than 6 mm thickness should be taken; (b) the samples should be removed from the apparatus 15 seconds after starting the experiment; not less than 5 determinations should be carried out. Fig. 5 gives the ratio between the static modulus and the hardness of the rubber (during a 24-hour experiment) for CKC-30, CKH-26, HK, and a production sample; Fig. 6: a curve for the determination of the static modulus according to the hardness of the rubber according to Shore; Fig. 7: a curve for the conversion of the hardness number according to Jones (Dzhons) (on apparatus TUM-2) into a Shore hardness number (on apparatus TM-2). There are 7 Figures and 6 References: 3 Russian, 3 English.

ASSOCIATION: The Research Institute of the Rubber Industry.
(Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti).

AVAILABLE: Library of Congress.

Card 3/3

BARTENEV, G.M.; KOLBASNIKOVA, A.I.

Effect of various factors on glass tempering. Inzh.-fiz.zhur. no.5:
99-103 My '58. (MIRA 12:1)

1. Nauchno-issledovatel'skiy institut stekla, g. Moskva.
(Glass)

SOV/24-58-9-22/31

AUTHORS: Bartenev, G.M. and Lavrent'yev, V.V. (Moscow)

TITLE: The Law of Friction for Highly Elastic Materials
(O zakone treniya vysokoelasticheskikh materialov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 9, pp 126 - 129 (USSR)

ABSTRACT: The paper is a continuation of Bartenev's previous work (Refs 1, 6, 7). In addition to this work, the results of Harry and Prock (Ref 2), Thirion (Ref 3), Denny (Ref 4) and Schallamach (Ref 5) are reviewed, with special reference to the law connecting μ , the friction coefficient of rubber on a smooth surface (for example, polished steel), with P , the normal load, S' , the nominal area of contact and S''_0 , the actual residual area of contact as $p \rightarrow 0$, where $p = P/S'$. The relationship proposed earlier by Bartenev (Ref 6):

$$\frac{1}{\mu} = \frac{1}{C} \frac{1 + \alpha p}{\alpha + S''_0/S'p} \quad (4)$$

Card1/2

where α is a constant depending on the elasticity modulus of the rubber and C is a constant depending on the experimental conditions, is shown to reduce in special

SOV/24-58-9-22/31

The Law of Friction for Highly Elastic Materials

cases to the formulae used by some of the above workers. Experiments were carried out on SKN-18 rubber (Shore hardness 68) on aluminium at 23 and 65 °C and with two samples of SKN-26 rubber (Shore hardness 56 and 45, respectively) on steel at 23 °C. The values of c , α and S_0 are tabulated for the four sets of experiments;

Schallamach's formula: $\mu = BP^{-1/3}$ does not fit the experimental data. The difference between initial friction and friction with steady slip is also discussed. There are 5 figures, 1 table and 8 references, 4 of which are Soviet and 4 English.

ASSOCIATION: Institut rezinovoy promyshlennosti Pedagogicheskiy institut im. Potemkina (Rubber Industry Institute. Pedagogical Institute im. Potemkin)

SUBMITTED: November 18, 1957

Card 2/2

30V/24-58-10-27/34

AUTHORS: Bartenev, G. M., Polik, B. M. (Moscow)

TITLE: Features of Fracture of Glass under the Effect of Internal Stresses (Osobennosti razrusheniya stekla pod deystviyem vnutrennikh napryazheniy)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 10, pp 141-143 (USSR)

ABSTRACT: In earlier work of the author (Ref.3) it was found that tensile stresses extend to the surface, particularly in the case of quenching of components of closed shapes and most frequently in internal angles which, in this case, are weak spots. Scratches produced with a diamond or with cutters on such weak spots result in immediate cracking-up or accelerate spontaneous failure and thus reveal the tendency of the component to crack-up. The character of the fracture was investigated on specimens which failed spontaneously as well as on specimens which were scratched on the surface. In both cases the surface of the fracture was equal. Fig.1 shows a typical picture of the fracture of glass under the effect of internal stresses. Fig.2 shows a photograph of the surface of fracture in the presence of two foci of failure which propagate simultaneously from two opposite surfaces of the glass. Study of the fractured surfaces leads to the conclusion that the character of the

Card 1/3

SOV/24-58-10-27/34

Features of Fracture of Glass under the Effect of Internal Stresses.

fracture is similar to the fracture of glass under the effect of external tensile stresses. In both cases two zones can be observed, a mirror smooth zone and a coarse zone whereby the fracture begins from the focus of failure or from the centre of the fracture which in some cases can clearly be identified. In the case of fracture tests the tensile stresses increase with increasing size of the primary cracks. In the case of fracture due to internal stresses the conditions of growth of the cracks differ, due to the fact that along the cross-section there are tensile as well as compression stresses. In Fig.3 photographs are reproduced of specimens of flat glass with various degrees of hardening and it can be seen that the higher the strength of the glass, the smaller the size of the cells into which the glass fractures. It was established that, both in the case of tensile loading as well as in the case of spontaneous failure, during the first stage a primary crack occurs and as a result of the slow growth of this a mirror-smooth zone appears on the surface of fracture. This indicates that the tensile stresses are responsible for spontaneous failure of glass. The appearance of the fracture surface depends on the

Card 2/3

SOV/24-58-10-27/34

Features of Fracture of Glass under the Effect of Internal Stresses

magnitude of internal stresses. At low stresses the coarse zone is absent or little developed; at higher stresses, in addition to the mirror-smooth zone, there is a coarse zone, in the same way as in the case of fracture by tensile loading. This feature is explained by the fact that in the case of internal stresses, due to the low value of these stresses the speed of growth of the primary crack does not reach the critical value and practically no secondary cracks occur; at higher stresses the speed of growth of the primary crack reaches a critical value and in some cases decreases again below that value. There are 3 figures and 8 references, of which 3 are English, 2 Soviet, 2 German and 1 French.

ASSOCIATION: Institut stekla (Institute of Glass)

SUBMITTED: January 29, 1958.

Card 3/3

BARTENEV, G.M.; YEPIFANOV, G.I.

Nature of external friction of metallic surfaces [with summary in English]. Inzh.-fiz.sbur. no.12:18-24 '58.

(MIRA 11:12)

1. Pedagogicheskiy institut imeni Potenkina, Vecherniy mashinostroitel'nyy institut, g. Moskva.
(Friction)

AUTHOR: Bartenev, G.M.

69-20-3-8/24

TITLE: The Structure of Vulcanized Rubber and Its Permeability to Gases (Gazopronitsayemost' i struktura vulkanizovannykh kauchukov)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 305-310 (USSR)

ABSTRACT: The influence of the structure of vulcanizates on the permeability to gases has not been sufficiently investigated. Permeability to gases is also related to the frost resistance of the rubber. The presence of 7% of bound sulfur in the rubber decreases the permeability in natural rubber 3 times and in synthetic rubber SKS-30 4.5 times. Vulcanization in the experiments was carried out at 143°C and lasted 20 minutes for natural rubber and 60 minutes for SKS-30. If the number of cross linkages in the rubber is the same, the type of vulcanizing agent or accelerator has no influence on the permeability. All chemical bonds effect the permeability, but the effect of the cross linkages is strongest. The equilibrium modulus, as an index of the number of cross linkings, does not characterize the permeability of natural rubber vulcanizates, because it does not account for the other chemical bonds formed during vulcanization. The per-

Card 1/2